

REMARKS

Claims 1-6, all the claims pending in the application, stand rejected. Claims 1-6 are amended. Applicant believes that the amendment of the claims further clarifies the difference between the present invention and the cited references. In particular, the claims now refer to “first detection data” and “second detection data,” correcting blur by filter processing using a function of spatial frequencies, and the obtaining of Laplacian of phase based on detection data before and after blur amount correction. The amendment is supported by the originally filed specification at page 17, line 11 to page 18, line 6.

As a preliminary matter, Applicant notes that the Examiner’s summary states that there are seven claims pending. Only six claims are pending. Thus, the Examiner is respectfully requested to correct this statement for the record.

Drawings

The drawing amendments submitted with the previous response are accepted, which is greatly appreciated by the Applicant.

Request for Information

The Examiner provides a “request for information” with regard to statements made in responding to the previous Office Action. No statutory basis or rule is identified by the Examiner. The Examiner is respectfully requested to do so, in order to permit Applicant to pursue any further relief by way of petition or appeal.

Applicant acknowledges that the Examiner may have intended the basis for the request to be 37 C.F.R. § 1.105. To the extent that this assumption is correct, Applicant is providing the following answers that are believed to be fully responsive to the questions. Applicant has divided the questions at pages 2 and 3 of the Office Action into four categories.

Plural Sets of Detection Data

At pages 2 and 3 of the Office Action, the Examiner raises questions concerning Applicants’ assertion that Gureyev does not disclose “plural sets of detection data obtained by

detecting intensity of radiation on plural detecting planes at different distances for the object." The Examiner raises several questions, as follows, and Applicant's answers are as indicated.

1. Is Applicant alleging that plural sets of detection data obtained by detecting intensity radiation on plural detecting planes at different distances for the object are in fact unknown in the prior art?

Answer: No, Applicant is simply alleging that Gureyev does not disclose such subject matter.

2. Is the inventor or the assignee of record aware of work by another performed before October 3, 2003 that includes plural sets of detection data obtained by detecting intensity of radiation on plural detecting planes at different distances for the object?

Answer: Neither the inventor nor the assignee of record is aware of work by another performed before October 3, 2003 that includes plural sets of detection data obtained by detecting intensity of radiation on plural detecting planes at different distances for the object. Applicant further notes that the claimed priority date is October 4, 2002 and priority has been both claimed and perfected. Finally, Applicant notes that the Examiner's query is broader than required under U.S. law, as public use or sale outside of the United States would not be prior art.

3. If such work by another is known to the inventor, is known to the inventor or the assignee then disclose this information in an Information Disclosure Statement. If such information has previously been disclosed by the Applicant or in a reference listed in the PTO-892, and then identify the reference, page and line number that shows this information.

Answer: Please see answer to question 2. In short, such work by another is not known to the inventor or the assignee of record. Applicant has excluded art cited by the Examiner in answer to this question. Finally, Applicant notes that it is not required to perform a search for any such information and has not done so in response to this question.

4. Has Applicant or the assignee of record filed any applications in this or in a foreign country that disclose or claim plural sets of detection data obtained by detecting intensity of radiation on plural detecting planes at different distances? If so, please disclose these applications.

Answer: Applicant already has identified it's priority document for the present application. There also are applications that correspond to the present application, whose concordance is available to the Examiner through on-line sources. Finally, There are some applications filed by the applicant or the assignee of record in Japan and U.S. that disclose or claim plural sets of detection data obtained by detecting intensity of radiation, on plural detecting planes at different distances. Applicant is enclosing an APPLICATION LIST that identifies applications related to restoring phase information. Applicant notes that these applications had not been published at the time the present application was filed in U. S.

5. Has this office or a foreign office ever rejected any claims filed by the assignee that include plural sets of detection data obtained by detecting intensity of radiation on plural detecting planes at different distances? If so, please disclose the rejections.

Answer: Yes, the present rejections. Also, U.S. patent application 10/671,786 received a first Office Action dated May 14 , 2007 in which claims were rejected.

Differential Data

The Examiner notes Applicants' argument that there is no consideration of different distances and thus no consideration of first and second data in Gureyev. The Examiner raises the following questions.

1. Is Applicant alleging that obtained differential data representing a difference between a first set of detection data and a second set of detection data is in fact unknown in the prior art?

Answer: The comment is directed to Gureyev.

2. Is the inventor or the assignee of record aware of work by another performed before October 3, 2003 that includes obtaining differential data representing a difference between a first set of detection data and a second set of detection data?

Answer: Neither the inventor nor the assignee of record is aware of work by another performed before October 3, 2003 that includes obtaining differential data representing a difference between a first set of detection data and a second net of detection data. Further, as already stated, Applicant has perfected it's claim to priority, establishing a priority date of October 2, 2002.

Finally, Applicant objects to the question as overly broad since it is not limited to use or sale in the United States.

3. If such work by another is known to the inventor or the assignee, then disclose this information in an Information Disclosure Statement. If such information has previously been disclosed by the Applicant or in a reference listed in the PTO-892, and then please identify the reference, page and line number that shows this information.

Answer: Such work by another is not known to the inventor or the assignee of record. Also, see answer to question above.

4. Has Applicant or the assignee of record filed any applications in this or in a foreign country that disclose or claim obtaining differential data representing a difference between a first set of detection data and a second set of detection data? If so, please disclose these applications.

Answer: There are some applications filed by the applicant or the assignee of record in Japan and U.S. that disclose or claim obtaining differential data representing a difference between a first set of detection data and a second set of detection data. Those applications are included in the attached APPLICATION LIST.

5. Has this office or a foreign office every rejected any claims filed by assignee that recite obtaining differential data representing a difference between a first set of detection data and a second set of detection data? If so, please disclose the rejections.

Answer: Yes, the present rejections. Also, U.S. patent application 10/671,786 received a first Office Action dated May 14, 2007 in which claims were rejected.

Obtaining Laplacian of Phase and Phase Data

At page 4 of the Office Action, the Examiner raises questions with regard to Applicant's comments concerning steps (c) and (d) of the claim and the failure of Gureyev to teach such steps.

1. Is Applicant alleging that obtaining Laplacian of phase on the basis of differential data and any one of plural sets of detection data is in fact unknown in the prior art?

Answer: Applicant is alleging that Gureyev does not teach this feature. Also, Applicants are not aware of everything that is taught in the prior art.

2. Is the inventor or the assignee of record aware of work by another performed before October 3, 2003 that includes obtaining Laplacian of phase on the basis of differential data and any one of plural sets of detection data?

Answer: The inventor or the assignee of record is not aware of work another performed before October 3, 2003 that includes obtaining Laplacian phase the basis of differential data and any one of plural sets of detection data.

3. If such work by another is known to the inventor or the assignee then disclose this information in an Information Disclosure Statement. If such information has previously been disclosed by the Applicant or in a reference listed in the PTO-892, and then please identify the reference, page and line number that shows this information.

Answer: Such work by another is not known to the inventor or the assignee of record.

4. Has Applicant or the assignee of record filed any applications in this or a foreign country that disclose or claim obtained Laplacian of phase on the basis of differential data and any one of plural sets of detection data? If so, please disclose these applications.

Answer: There are some applications filed by the Applicant or the assignee of record, in Japan, and U.S. that disclose or claim obtaining Laplacian of phase on the basis of differential data and any one of plural sets of detection data. These applications are included in the APPLICATION LIST.

5. Has this office or a foreign office every rejected any claims filed by assignee that recite obtaining Laplacian of phase on the basis of differential data in any one of plural sets of detection data? If so, please disclose the rejections.

Answer: Yes, the present rejections. Also, U.S. patent application 10/671,786 received a first office Action dated May 14, 2007 with claim rejections.

Obtaining Phase Data by Inverse Laplacian Computation

1. Is the Applicant alleging that obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase is in fact unknown in the prior art?

Answer: Applicant is alleging that Gureyev does not teach this feature.

2. Is the inventor or the assignee of record aware of work by another performed before October 3, 2003 that includes obtaining phase data above the radiation by performing inverse Laplacian computation on the Laplacian of phase?

Answer: The inventor or the assignee of record is not aware of work by another performed before October 3, 2003 that includes obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase. Also, see answer above.

3. If such work by another is known to the inventor or the assignee, then disclose this information in an Information Disclosure Statement. If such information has previously been disclosed by the Applicant or in a reference listed in the PTO-892, and then please identify the reference, page and line number that shows this information.

Answer: Such work by another is not known to the inventor or the assignee of record.

4. Has Applicant or the assignee of record filed any application in this or a foreign country that disclose or claim obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase? If so, please disclose these applications.

Answer: There are some applications filed by the Applicant or the assignee of record in Japan and U.S. that disclose or claim obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase. Those applications are included in the attached APPLICATION LIST.

5. Has this office or a foreign office every rejected any claims filed by assignee that recite obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase? If so, please disclose the rejections.

Answer: Yes, the present rejections. Also, U.S. patent application 10/671,786 received a first Office Action dated May 14, 2007 in which claims were rejected.

Search of Prior Art

The Examiner asks Applicant to state whether any search of prior art was performed in response to this requirement. Applicant respectfully submits that the question is overly broad

and indefinite. Applicant submits that it has no obligation to perform a prior art search prior to filing the application or in response to this Examiner's questions.

Answer: No search of prior art was performed. Further, no search report is issued by any patent office.

If any art retrieved from the search was considered material to demonstrating the knowledge of a person having ordinary skill in the art in the disclosed method of restoring phase information, please provide the citation for each piece of art considered and a copy of the art.

Answer: None.

Specification

The Examiner objects to the Title and requires a new Title indicative of the subject matter that is claimed. Applicant has amended the Title to read:

“A Method of Restoring Phase Information By Correcting a Blur Amount and Using a Laplacian of Phase”

Claim Rejections – 35 USC 101

Claims 1-6 are rejected under 35 USC 101, as being directed to non-statutory subject matter. This rejection is traversed for at least the following reasons.

The claims previously were amended to overcome the same rejection where the claims were directed to a program *per se*. Now the Examiner requires a change from “a program product containing a computer readable program” to a “computer readable medium storing a computer readable program.” This change has been made.

Claim Rejections – 35 USC 103

Claims 1-6 are rejected under 35 USC 103(a) as being unpatentable over “Hard X-ray Quantitative Non-Intreferometric Phase-Contrast Imaging” by Gureyev et al, SPIE vol. 3659, Feb 1999, pp 356-364 (Gureyev) in view of Ishisaka et al (6,404,848). This rejection is traversed for at least the following reasons.

In framing the rejection, the Examiner substantially repeats the basis for rejection stated in the previous Office Action, except that at page 8, the Examiner further explains that Gureyev states at page 361 as follows:

We then computed the free-space propagation (calculating the full Kirchhoff integral) of that complex amplitude from the plane $z=0$ to $z=0.15m$.” Applicants also admits that this feature is prior art. Page 17 of the application admits that “even if phase information is obtained by using plurals sets of detection data having non-uniform blur amounts as in a conventional method...” Presumably the conventional method is Gureyev.)

In the Response to Arguments at page 10 of the Office Action, the Examiner states that the Applicants arguments are not persuasive and identifies several points of disagreement.

Gureyev et al

No Disclosure of Plural Sets of Detection Data

In the previous Amendment dated March 8, 2007, Applicants argued at page 10 that Gureyev does not disclose the “plural sets of detection data ...for the object” as claimed. The Examiner notes that at page 17 of the application, Applicant admits that obtaining phase information using plurals sets of detection data is conventional (see line 5). The Examiner assumes that Gureyev discloses this conventional method.

In reply, Applicant submits that the method is not taught in Gureyev, and that the statement in the specification is true, while the Examiner’s assumption is not correct.

No Disclosure of Blur Correction in Gureyev

The Examiner has asserted that the Applicants’ comments with regard to a failure of Gureyev to teach blur correction is not relevant as it is an attack on the reference individually. However, this comment is valid because it shows Gureyev never thought of blur as being a problem in his system.

Ishisaka's Blur Correction Not For Gureyev's Steps

The Examiner notes at page 11 that Applicants argued that Ishisaka does not disclose using blur correction in the specific steps of phase contrast imaging and does not teach that Gureyev should be modified to add blur correction. The Examiner acknowledges that some teaching suggestion or motivation must be provided either in the references themselves or in the knowledge generally available to one skilled in the art for such combination.

The Examiner notes that the blur problem that is disclosed in the background section of Ishisaka is the same problem that is disclosed in the present application. The Examiner also notes at page 12 that the solution given by Ishisaka is a solution for blur correction in phase contrast imaging, as discussed in the summary. Thus, the Examiner finds the teaching needed for applying Ishisaka to Gureyev. Applicants would disagree.

In the present application, when the phase difference for radiation transmitted through an object is converted into brightness so that differences in soft tissue can be identified, a diffraction fringe pattern, which is generated due to images formed at different distances by radiation from a uniform phase source, is used. A problem occurs with a blur factor that varies with distance, as explained at pages 6 and 7 of the specification.

Given this specific problem, the invention corrects blur for at least one or plural sets of detection data, the data of each set being obtained by detecting intensity of radiation on plural detection planes at different distances from the object. A difference is then obtained between first and second data sets, where at least one has blur correction. A Laplacian of phase is then obtained, on the basis of (1) the differential data, (2) any one of the plural sets of detection data, and (3) the detection data in which the blur amount has been corrected. Finally, phase data is obtained by performing inverse Laplacian on the Laplacian of phase.

Clearly the foregoing approach to the problem requires a specific application of blur correction.

Ishisaka

In Ishisaka, blur is considered only in general. The reference merely observes at col. 1, lines 34-57 that the size of the focal spot of the X-ray being a finite value, blurs called penumbra are generated. The blurs are not found where a point source of light is used, but occur as a matter of practice where the focal spot has a finite size. The problem is increased where the magnifying ratio is increased, such that the sharpness of the image is deteriorated.

Ishisaka optimizes a relationship between the blur due to penumbra and edge enhancement, so that a sharp image is created. However, Ishisaka does not recognize that blur correction can be applied to the data, as processed according to the claimed invention. There is no suggestion that blur should be corrected on the basis of first and second data sets, one having blur correction, and then using that data in calculating a Laplacian of phase.

Absence of Steps c and d

Applicants would again assert that steps (c) and (d) of the method of claims 1 and 5, and the function of the means in apparatus claim 3, is not disclosed in Gureyev et al. This argument has not been addressed by the Examiner. The Examiner asserted that the obtaining of Laplacian of phase and obtaining phase data by performing inverse Laplacian computation is taught at pages 357 and 360.

Applicants would strongly disagree. First, there is no mention of Laplacian computation on the basis of three factors, including (1) differential data, (2) any one of the plural sets of detection data, and (3) detection data in which blur amount has been corrected, at those pages of the reference. Second, even if the disclosure would be interpreted to teach Laplacian computation in general, there is no teaching or suggestion as to how or why the three factors, especially blur factors, should be considered together. Third, there is no teaching or suggestion of a use of an inverse of the Laplacian computation, based on blur factors, as in step (d).

Again, the consideration of blur in Ishisaka is broad and general, and does not support the more specific application of blur correction into the specific steps of Gureyev. Nothing in Ishisaka teaches that Gureyev should be modified to consider blur and, in particular, that Gureyev should be modified in the manner claimed (as original and as now clarified).

As already noted, Gureyev is deficient not teaching the specific Laplacian computation as claimed. There is no basis for asserting that this missing computation should be supplied and that blur considerations should also be added. Further, , there is no teaching as to how Gureyev would be modified to consider blur, and arrive at the claimed invention. Third, the focus of Ishisaka is only on edge enhancement to eliminate blur. However, there is no teaching or suggestion for the calculation of phase data using blur compensation in the manner claimed for all of the recited steps.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: July 26, 2007

ISSN 10/677241

Attachment

2/20/07

APPLICATION LIST

Japanese Reference No.	Japanese Application No.	Japanese Publication No.	Japanese Publication Date	U. S. Reference No.	U. S. Application No.	U. S. Application Date	U. S. Patent No.
KP2708	P2002-141000	P2003-325498A	2003. 11. 18	FP224US	10/426,852	2003. 05. 01	6,724,857
KP2709	P2002-141001	P2003-325501A	2003. 11. 18				
KP2710	P2002-120735	P2003-310593A	2003. 11. 05	FP222US	10/413,511	2003. 04. 15	6,704,591
KP2711	P2002-128662	P2003-319928A	2003. 11. 11	FP223US	10/418,082	2003. 04. 18	7,171,031
KP2712	P2002-128663	P2003-324654A	2003. 11. 14	FP223US	"	"	"
KP2961	P2002-285252	P2004-113708A	2004. 04. 15	FP237US	10/671,786	2003. 09. 29	
KP2962	P2002-293740	P2004-121741A	2004. 04. 22	FP237US	"	"	
KP2963	P2002-292642	P2004-121659A	2004. 04. 22	FP243US	The Present Application		
KP2964	P2002-301584	P2004-140492A	2004. 05. 13				
KP3307	P2003-172708	P2005-6782A	2005. 01. 13				